Alfie Has 11 Cards.He Has3 Blue Cards7 Green Cardsand 1 White Card.Alfie Takes At Random 2 Of These Cards.Work

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Understanding probabilities in everyday scenarios can be both fascinating and educational. In this article, we delve into a specific problem involving Alfie's collection of cards, exploring the various outcomes and likelihoods associated with randomly selecting two cards from a set of 11. Whether you're interested in basic probability concepts or looking for a detailed step-by-step solution, this comprehensive guide will clarify the process and provide insights into how such problems are approached.

Introduction to the Problem

Before diving into calculations, it's essential to understand the problem's scenario clearly:

- Alfie possesses a total of 11 cards.
- These cards are categorized by color:
- 3 Blue Cards
- 7 Green Cards
- 1 White Card
- Alfie randomly selects 2 cards from this collection.
- The task is to analyze the possible outcomes of this selection:
- What is the probability of drawing specific combinations?
- How many possible pairs can Alfie draw?
- What are the chances of drawing certain color combinations?

By breaking down the problem into these components, we can systematically analyze the probability distribution for all possible outcomes.

Understanding the Composition of Alfie's Cards

Breakdown of Card Types

Alfie's collection consists of three types of cards:

- Blue Cards: 3 in total
- Green Cards: 7 in total
- White Card: 1 in total

Total number of cards: 3 + 7 + 1 = 11

This distribution influences the likelihood of drawing specific cards during random selection.

Implications for Probabilities

Since the White Card is unique, the probability of drawing it depends on its single presence compared to the total deck. The multiple Green and Blue cards increase the chances of drawing those colors.

Calculating the Total Number of Possible Outcomes

In probability problems involving selecting a subset of items from a larger set without replacement, the total number of possible outcomes is given by combinations.

Number of Ways to Choose 2 Cards from 11

The total number of ways Alfie can pick 2 cards from 11 is calculated using the combination formula:

$$
\boxed{
\text{Total Outcomes} = \binom{11}{2} = \frac{11 \times 10}{2 \times 1} = 55
}
$$

Thus, there are 55 possible different pairs of cards Alfie could select at random.

Possible Card Combinations and Their Counts

Next, we examine the different types of pairs Alfie could draw, focusing on the color combinations.

Types of Pairs to Consider

The possible pairs can be categorized based on the color combinations:

- Both cards are Blue
- Both cards are Green
- Both cards are White
- One Blue and one Green
- One Blue and one White
- One Green and one White

Since the White card is unique, specific combinations involving it will have different counts compared to others.

Calculating the Number of Each Type of Pair

Let's analyze each pairing type:

1. Blue-Blue Pairs

Number of Blue cards: 3

Number of ways to choose 2 Blue cards:

$$
\binom{3}{2} = 3
$$

There are 3 possible Blue-Blue pairs.

2. Green-Green Pairs

Number of Green cards: 7

Number of ways to choose 2 Green cards:

$$
\binom{7}{2} = \frac{7 \times 6}{2} = 21
$$

There are 21 Green-Green pairs.

3. White-White Pairs

Number of White cards: 1

Since only one White card exists, White-White pairs are impossible:

$$
\binom{1}{2} = 0
$$

No White-White pairs.

4. Blue-Green Pairs

Number of Blue cards: 3

Number of Green cards: 7

Number of ways to pick one Blue and one Green:

$$
3 \times 7 = 21
$$

Each Blue card can pair with any Green card, so there are 21 such pairs.

5. Blue-White Pairs

Number of Blue cards: 3

Number of White cards: 1

Number of ways:

$$
3 \times 1 = 3
$$

Each Blue card can pair with the White card, resulting in 3 pairs.

6. Green-White Pairs

Number of Green cards: 7

Number of White cards: 1

Number of ways:

\[

7 \times 1 = 7
\]

Each Green card can pair with the White card, leading to 7 pairs.

Summary of Pair Counts

Pair Type	Number of Pairs
Blue-Blue	3
Green-Green	21
White-White	0
Blue-Green	21
Blue-White	3
Green-White	7

Total pairs: 3 + 21 + 0 + 21 + 3 + 7 = 55, confirming the total possible pairs.

Calculating Probabilities of Specific Outcomes

Using the counts above, we can now determine the probability of each type of pair.

Probability Formula

\[
\boxed{
P(\text{event}) = \frac{\text{Number of favorable outcomes}}{\text{Total outcomes}}
}
\]

Where total outcomes = 55.

Examples of Probabilities

a. Probability of drawing two Green cards

\[
P(\text{Green-Green}) = \frac{21}{55} \approx 0.3818 \text{ or } 38.18\%
\]

b. Probability of drawing one Blue and one White

$$
P(\text{Blue-White}) = \frac{3}{55} \approx 0.0545 \text{ or } 5.45\%
$$

c. Probability of drawing two Blue cards

$$
P(\text{Blue-Blue}) = \frac{3}{55} \approx 0.0545 \text{ or } 5.45\%
$$

d. Probability of drawing a Blue and a Green

$$
P(\text{Blue-Green}) = \frac{21}{55} \approx 0.3818 \text{ or } 38.18\%
$$

e. Probability of drawing a Green and White

$$
P(\text{Green-White}) = \frac{7}{55} \approx 0.1273 \text{ or } 12.73\%
$$

Additional Considerations in the Problem

Besides calculating the probabilities of specific pairs, you might also want to explore:

1. Probability of drawing at least one White Card

Since there is only one White card, and the total pairs are 55, the favorable outcomes involving White are:

- White-Green pairs: 7

- White-Blue pairs: 3

Total involving White: 7 + 3 = 10

Probability:

$$
P(\text{at least one White}) = \frac{10}{55} = \frac{2}{11} \approx 0.1818 \text{ or } 18.18\%
$$

Note: Since the White card appears only once, the only way to draw White is in pairs involving it.

2. Probability of drawing two cards of the same color

Sum of same-color pairs:

$$
3 (\text{Blue-Blue}) + 21 (\text{Green-Green}) + 0 (\text{White-White}) = 24
$$

Probability:

$$
P(\text{same color}) = \frac{24}{55} \approx 43.64\%
$$

3. Probability of drawing two cards of different colors

Total different-color pairs:

$$
55 - 24 = 31
$$

Probability:

$$
P(\text{different colors}) = \frac{31}{55} \approx 56.36\%
$$

Practical Applications and Learning Outcomes

Understanding such probability scenarios provides valuable insights into real-world situations, including:

- Games and Gambling: Calculating odds of drawing specific cards or combinations.
- Statistics and Data Analysis: Applying basic combinatorial concepts to analyze datasets.
- Decision Making: Weighing probabilities to inform choices in uncertain situations.
- Educational Contexts: Teaching fundamental probability concepts through engaging examples.

By mastering these calculations, learners can develop a solid foundation for more complex probability and combinatorial problems.

Conclusion

Analyzing Alfie’s card drawing problem offers a comprehensive view of basic probability and

Frequently Asked Questions

What is the total number of cards Alfie has?

Alfie has a total of 11 cards.

How many blue cards does Alfie have?

Alfie has 3 blue cards.

How many green cards does Alfie have?

Alfie has 7 green cards.

How many white cards does Alfie have?

Alfie has 1 white card.

What is the probability that Alfie randomly picks 2 blue cards?

The probability is calculated as the number of ways to choose 2 blue cards over the total ways to choose any 2 cards: (3C2) / (11C2) = 3 / 55.

What is the probability that Alfie picks at least one white card?

Since there is only 1 white card, the probability of picking it in 2 cards is: 2/11 (probability white is in the first pick) + (9/11)(1/10) (white in second pick if not in the first) = 2/11 + (9/11)(1/10) = 2/11 + 9/110 = (20/110) + (9/110) = 29/110.

How many ways can Alfie choose any 2 cards from his collection?

There are 55 ways to choose any 2 cards from 11 cards, since 11C2 = 55.

What is the chance that Alfie picks two green cards?

The probability is (7C2) / (11C2) = 21 / 55.

Are there more green or blue cards in Alfie's collection?

There are more green cards (7) than blue cards (3).

Additional Resources

Comprehensive Analysis of Alfie’s Card Draw Scenario: An In-Depth Exploration

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Introduction

Probability and combinatorics often intersect in intriguing ways, especially when analyzing scenarios involving random draws from a finite set of items. The scenario involving Alfie’s collection of cards—comprising 3 blue, 7 green, and 1 white card—presents an excellent case for examining such concepts. Alfie has a total of 11 cards, and he randomly selects 2 of them without replacement. This situation offers a rich landscape for exploring probabilities of various outcomes, understanding the nature of uniform random selection, and applying combinatorial formulas. In this comprehensive review, we'll delve into each aspect meticulously, unpacking the problem and its broader implications.

Setting the Scene: The Composition of Alfie’s Cards

Before analyzing probabilities, it’s essential to understand the foundational setup:

- Total Cards: 11
- Color Distribution:
- Blue Cards: 3
- Green Cards: 7
- White Cards: 1

This distribution influences the likelihood of drawing particular colors or combinations. Recognizing the composition allows for precise calculation of probabilities for different events.

Fundamental Concepts in the Problem

1. Total Number of Ways to Draw 2 Cards

When selecting 2 cards from 11 without replacement, the total number of equally likely outcomes is given by the combination formula:

\[

$$
\text{Total Outcomes} = \binom{11}{2} = \frac{11 \times 10}{2} = 55
$$

This figure establishes the baseline for all probability calculations.

2. Types of Events and Outcomes

Depending on what we are interested in, the outcomes can be categorized as:

- Both cards of the same color
- Two different colors
- Specific color pairs (e.g., blue then white)
- Drawing at least one white card
- Drawing exactly one white card

Each of these scenarios involves different combinatorial considerations.

Probabilistic Analysis: Exploring Different Events

Now, we analyze the probabilities of various events based on the composition.

Event 1: Both Cards Are of the Same Color

This event involves calculating the probability that the two randomly selected cards share the same color.

Calculations:

- Blue-Blue: Select 2 blue cards out of 3:

$$
\binom{3}{2} = 3
$$

- Green-Green: Select 2 green cards out of 7:

$$
\binom{7}{2} = 21
$$

- White-White: Only 1 white card exists, so:

$$
\binom{1}{2} = 0 \quad (\text{Impossible})
$$

Total favorable outcomes:

$$
3 + 21 + 0 = 24
$$

Probability:

$$
P(\text{both same color}) = \frac{24}{55} \approx 0.4364
$$

This indicates that there’s roughly a 43.64% chance of drawing two cards of the same color.

Event 2: Both Cards Are of Different Colors

Complementary to the previous event.

Calculation:

$$
P(\text{different colors}) = 1 - P(\text{same color}) = 1 - \frac{24}{55} = \frac{31}{55} \approx 0.5636
$$

Alternatively, directly calculating:

- Blue-Green pairs:

$$
\text{Number of pairs} = 3 \times 7 = 21
$$

- Blue-White pairs:

$$
3 \times 1 = 3
$$

- Green-White pairs:

$$
7 \times 1 = 7
$$

Total different color pairs:

$$
21 + 3 + 7 = 31
$$

\]

Probability:

\[
\frac{31}{55} \approx 0.5636
\]

Event 3: Drawing a White Card

Given that only one white card exists, the chance of drawing the white card in the two picks is straightforward.

Number of favorable outcomes:

- White card in first pick, any second card:

\[
\binom{1}{1} \times \binom{10}{1} = 1 \times 10 = 10
\]

- White card in second pick, first card not white:

\[
\text{Number of ways to pick first non-white} = 10
\]

Total favorable outcomes:

\[
10 + 10 = 20
\]

But note that the total outcomes are 55, and since the white card can be drawn in either of the two positions, the total favorable outcomes are:

\[
\text{Number of outcomes with at least one white card} = \text{Total outcomes with exactly one white card} + \text{Total outcomes with both white cards (impossible here)}
\]

Because only one white card exists, the only way to have a white card is when it appears in one of the two picks, with the other card any of the remaining 10.

Probability:

\[

$$
P(\text{at least one white}) = \frac{20}{55} = \frac{4}{11} \approx 0.3636
$$

Deep Dive: Probabilities of Specific Color Combinations

Beyond the basic probabilities, analyzing the likelihood of specific pairings can provide richer insights.

Event 4: Drawing a Blue and a Green Card

Number of such pairs:

$$
3 \times 7 = 21
$$

Probability:

$$
\frac{21}{55} \approx 0.3818
$$

This indicates a moderate likelihood of drawing one blue and one green card in two picks.

Event 5: Drawing the Blue and White Card

Number of such pairs:

$$
3 \times 1 = 3
$$

Probability:

$$
\frac{3}{55} \approx 0.0545
$$

A relatively low probability, reflecting the rarity of the white card and the specific pairing.

Advanced Considerations: Conditional Probabilities and Expected Values

Now, let's explore more nuanced aspects, such as the probability of certain events given prior outcomes, and expected values.

Conditional Probability: Given that a Blue Card Was Drawn First, What's the Probability that the Second Card Is Green?

Step 1: Probability that the first card is Blue:

\[
P(\text{first card blue}) = \frac{3}{11}
\]

Step 2: Given that the first card is blue, remaining cards:

- Blue: 2
- Green: 7
- White: 1

Total remaining cards: 10

Step 3: Probability that the second card is green:

\[
P(\text{second green} | \text{first blue}) = \frac{7}{10}
\]

Combined probability:

\[
P(\text{first blue, second green}) = P(\text{first blue}) \times P(\text{second green} | \text{first blue}) = \frac{3}{11} \times \frac{7}{10} = \frac{21}{110} \approx 0.1909
\]

This exemplifies how conditional probabilities can be calculated in sequential drawing scenarios.

Expected Values: Average Number of White Cards in Multiple Draws

While in this scenario only two cards are drawn, extending the problem to larger samples can involve calculating expected values.

Expected number of white cards in 2 draws:

- Probability that the white card is drawn in the first pick:

\[

$$
\frac{1}{11}
$$

- Probability that the white card is not drawn in the first but in the second:

$$
\text{Probability white not in first} = \frac{10}{11}
$$

- Given the first card is not white, probability that the second card is white:

$$
\frac{1}{10}
$$

Expected value E:

$$
E = 0 \times P(\text{white not drawn}) + 1 \times P(\text{white drawn})
$$

$$
P(\text{white drawn}) = P(\text{white in first}) + P(\text{white in second})
$$

$$
= \frac{1}{11} + \left(\frac{10}{11} \times \frac{1}{10}\right) = \frac{1}{11} + \frac{1}{11} = \frac{2}{11} \approx 0.1818
$$

Thus, on average, about 0.18 white cards are expected to be drawn per two-card selection.

Broader Implications: Real-World Applications and Educational Value

Analyzing such card-draw scenarios isn’t merely an academic exercise; it has broader applications in diverse fields:

- Game Theory & Gambling: Understanding odds helps in strategic decision-making.
- Risk Assessment: Calculating probabilities of certain outcomes underpins insurance and finance.
- Educational Tools: Teaching probability and combinatorics through tangible examples enhances comprehension.
- Decision Science: Modeling uncertainties in real-world choices.

This scenario also emphasizes the importance of understanding finite sample spaces, the role

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